

Risk Management



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Farmers Sharpen Tools To Confront Business Risks

As in any industry, risk is a part of the business of agriculture. With farm income currently under pressure from declining farm prices, USDA's Economic Research Service is exploring the subject of risk management in agriculture. This article, the first in a series, describes a variety of management techniques farm operators use to survive swings in weather, markets, and the economy. Other topics in the series will include USDA's farm risk initiatives and an analysis of the effectiveness of different crop and revenue insurance products.

Farmers face an ever-changing landscape of weather, prices, yields, government policies, global competition, and other factors that affect their financial returns and overall welfare. With the shift toward less government intervention following passage of the 1996 Farm Act came recognition of the need for a more sophisticated understanding of farm risk and risk management. Risk management strategies can help mitigate the effects of swings in supply, demand, and prices, so that farm business returns can be closer to expectations.

Risk management is, in general, finding the combination of activities most preferred by an individual farmer to achieve

the desired level of return and an acceptable level of risk. Risk management strategies reduce risk within the farming operation (e.g., diversification or vertical integration), transfer a share of risk outside the farm (e.g., production contracting or hedging), or build the farm's capacity to bear risk (e.g., maintaining cash reserves or evening out cash flow). Using risk management does not necessarily avoid risk altogether, but instead balances risk and return consistent with a farm operator's capacity to withstand a wide range of outcomes.

Although farms vary widely with respect to enterprise mix, financial situation, and other business and household characteristics, many sources of risk are common to all farmers, ranging from price and yield risk to personal injury or poor health. But even when facing the same risks, farms vary in their ability to weather shocks. For example, in an area where drought has lowered yields, falling prices resulting from large worldwide production could have devastating consequences for local farm incomes. With such a downturn, some bankruptcies are likely to occur, and producers who are highly leveraged and have small financial reserves or lack off-farm income would be most vulnerable.

What do farmers themselves say about the risks they face? USDA's 1996 Agricultural Resource Management Study (ARMS), conducted in the spring of 1997 (about a year after passage of the 1996 Farm Act), asked producers how concerned they were that certain types of risk could affect the viability of their farms. Three risk factors of greatest concern to farm operators were uncertainty regarding commodity prices, declines in crop yields or livestock production, and changes in government law and regulation. Issues such as price and yield have historically been a focus of government farm programs. But new policy areas, such as water pollution control and waste management, may well affect future legislation and regulation of agriculture and pose new challenges to operators.

ARMS data show that producers specializing in wheat, corn, soybeans, tobacco, and cotton were generally more concerned about the threat of low yield and/or low price than any other risk. Reduced government intervention in markets for program crops (wheat, corn, cotton, and other selected field crops) under the 1996 Farm Act may have heightened producers' uneasiness about price risk.

Producers of other field crops, nursery and greenhouse crops, and poultry expressed greater concern about changes in laws and regulations than about other risks. This perhaps reflects fears that changes in environmental and other policies could require costly compliance by the agricultural sector. Producers of the other field crops may be wary of changes in regulations addressing soil conservation, land use, and tillage practices, while livestock producers may be particularly concerned about regulations related to waste management and the spread of disease.

Livestock producers also expressed concern about their ability to adopt new technology, perhaps because failure to invest in new production techniques could put them at a cost disadvantage to other producers. For farm operators involved in contracts, expenditures necessary to satisfy production requirements imposed by contractors, such as modification of existing livestock buildings, may add to risk (AO January/February 1999).

Price & Yield Swings Pose Primary Risk

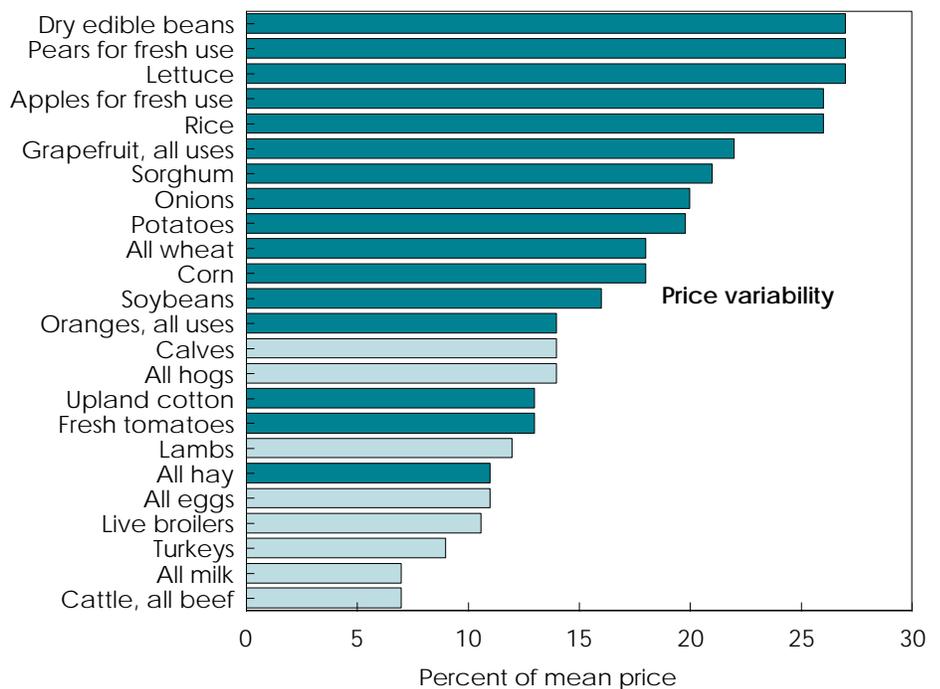
The possibility of lower-than-expected yield is one of the risks identified in the ARMS as a major concern to farmers. Yield variability for a given crop varies by geographic area and depends on factors such as soil type and quality, climate, and use of irrigation. Yield variability for corn, for example, tends to be lowest in the central Corn Belt, where soils are deep and rainfall is dependable, as well as in areas that are irrigated. In Nebraska, where much of the corn production is irrigated, yield variability is quite low. Yield variability is also low in Iowa, Illinois, and other Corn Belt states, where climate and soils provide a nearly ideal growing environment for corn production.

In areas less well suited to corn production, yield variability is generally higher, and producers must deal with the prospect of yields that can deviate significantly from planting-time expectations. Risks associated with high yield variability and the resulting income variability can be mitigated by programs such as Federal crop insurance, as well as by diversification and other tools to help spread farm-level risk.

Like yield variability, price variability differs among commodities. In 1987-96, crop prices showed relatively more variability than livestock prices, largely because crop supplies are affected by swings in crop yields while livestock supplies have been more stable—although recent variability in the hog market illustrates some exceptions exist. Crops that exhibited the highest price variability (deviations exceeding 20 percent above or below the mean) include dry edible beans, pears, lettuce, apples, rice, grapefruit, and grain sorghum. The variability of beef cattle, milk, and turkey prices was less than 10 percent, perhaps reflecting lower production risk and, in the case of milk, the existence of a Federal dairy program.

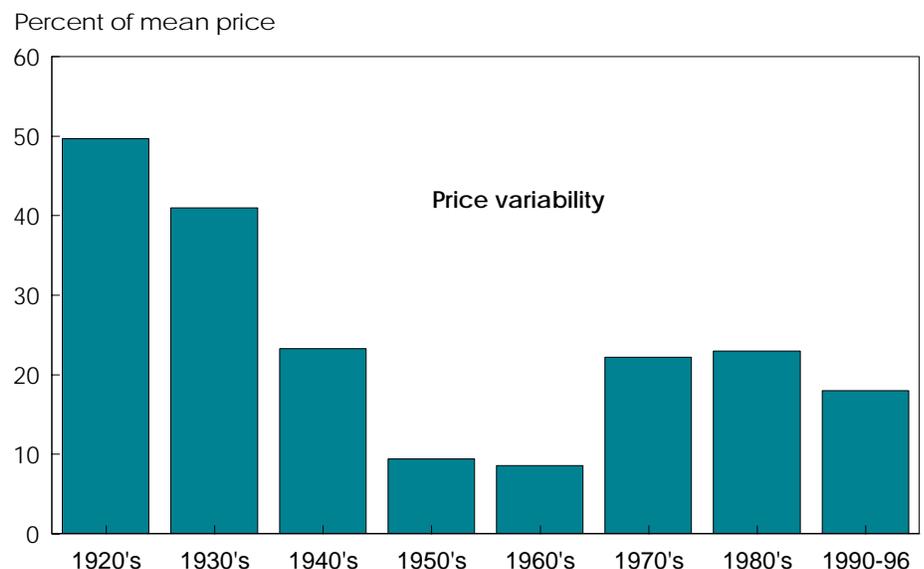
Price variability can change across time depending on year-to-year differences in crop prospects, changes in government program provisions, and shifts in world supply and demand conditions. For example, corn price variability was quite high

During 1987-96, Price Variability Was Generally Higher for Crops Than for Livestock



Price variability measures deviation above and below the mean price for the period 1987-96. Economic Research Service, USDA

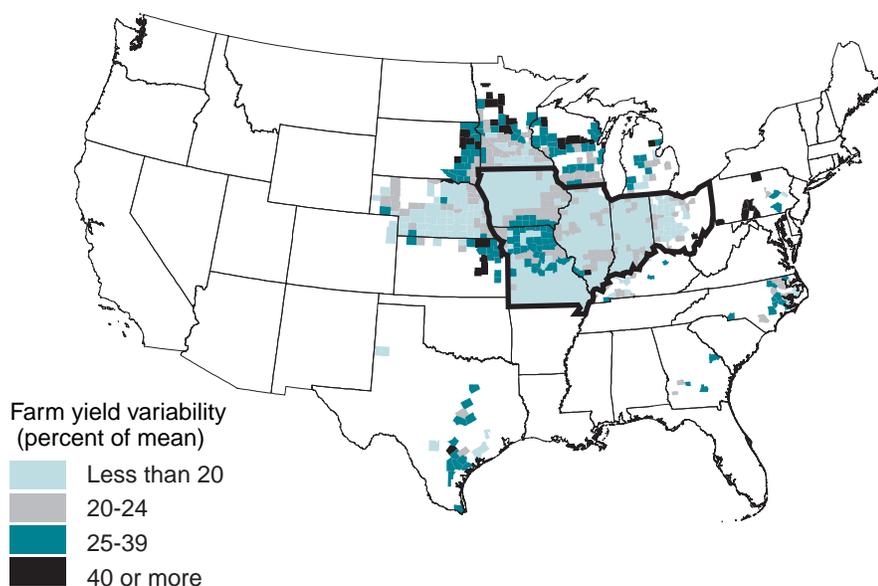
Corn Price Variability in the 1990's Is Near the Level of the Past Two Decades



Price variability measures deviation above and below the mean price for each period. Economic Research Service, USDA

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Corn Yield Variability is Generally Lower for Farms in the Heart Of the Corn Belt



Based on farm-level data, 1985-94, and long-term county-level yields. Includes counties with at least 500 acres planted to corn.

Economic Research Service, USDA

during the 1920's and 1930's, due largely to the collapse of grain prices after World War I and very low yields in 1934 and 1936. Corn prices stabilized during the 1950's and 1960's, a period of high government support, stable yields, and consistent demand. Sizable purchases of corn by Russia early in the 1970's affected variability during that decade, while low U.S. yields in 1983 and 1988 contributed to increased corn price variability in the 1980's. Variability returned to near long-term average levels in 1990-96.

“Natural Hedge” May Stabilize Revenues

Price and yield risks faced by a producer in a given situation, as well as the strength of the relationship between price and yield—the price-yield correlation—can influence the effectiveness of different risk management strategies. The stronger the negative correlation (i.e., yield and price moving in opposite directions), the better the “offsetting” relationship (or “natural hedge”) works to stabilize revenues.

The price-yield correlation for a commodity tends to be more strongly negative for farms in major producing areas, because

yields there are more positively correlated with national yields, and crop yields among farms within a region tend to move together. For example, in a major corn-producing area such as the Corn Belt, corn yields tend to be more positively correlated with a national corn yield, and therefore more negatively correlated with the national corn price. For wheat, where production is more dispersed and U.S. production is a smaller share of the world's crop, the natural hedge is weaker, making incomes more variable for most wheat growers.

When other factors are held constant, the magnitude of a producer's natural hedge has important implications for the effectiveness of various risk-reducing tools. A weaker natural hedge (where low prices more often accompany low yields), for example, implies that forward contracting or hedging in futures is more effective in reducing income risk than when a strong natural hedge exists. In this situation, locking in a sales price for part of the expected crop works to establish one component of the farm's revenue, reducing the likelihood of simultaneously low price and low yield. As a result, hedging can sometimes be an effective risk man-

agement strategy for farms outside major producing regions.

Deciding how much to hedge is more complicated than just assessing price-yield correlation. Income risk is also a function of price variability and yield variability. Hedging effectiveness declines as yield variability increases, and corn yields are typically more variable outside the Corn Belt. Since yield variability tends to outweigh the impact of price-yield correlation, hedging is generally not as effective in less consistent production areas as in the Corn Belt.

No Single Approach Suits All Farms

While factors such as yield variability, price variability, and price-yield correlation can be used to gauge the likely effectiveness of various risk management strategies, producers' attitudes toward risk are also determinants in selecting strategies. Some farmers are less risk averse than others, and, for example, might feel more comfortable in a highly leveraged situation (e.g., carrying a large mortgage) than would others. Similarly, producers may differ in their preferences for risk management tools, some perhaps feeling more at home with forward contracting with a local elevator while others may turn to hedging to manage their risks.

Because farmers face different degrees of variability and differ in their attitudes toward risk, there can be no single approach to suit all farms. Overall, farmers appear to be relying increasingly on forward contracting and other risk management tools to reduce their farm-level risks, due in part to the recent trend toward reduced government intervention in farming. Even so, the 1996 ARMS indicates that keeping cash (or liquid assets) on hand for handling emergencies and for taking advantage of good business opportunities was the number-one strategy used by farms of every size, every commodity speciality, and in every region.

Farm size apparently plays a role in choice of risk management strategy. The ARMS found that operators with annual gross sales of \$250,000 or more were more likely than smaller operators to use hedging, forward contracting, and

A Selection of Strategies for Mitigating Risk

Farmers have many options in managing the types of risks they face. For example, producers may 1) plant short-season crop varieties that mature earlier in the season to beat the threat of an early frost; 2) install supplemental irrigation in an area where rainfall is inadequate or unreliable; or 3) use custom machine services or contract/hired labor to plant and harvest quickly during peak periods.

Most producers use a combination of strategies and tools, because they address different elements of risk or the same risk in a different way. Following are some of the more widely used strategies.

- *Enterprise diversification*—assumes returns from various enterprises do not move up and down in lockstep, so low returns from some activities would likely be offset by higher returns from other activities. Diversification can also even out cash flow. According to USDA data, cotton farmers are among the most diversified in the U.S., while poultry farms, with poultry and poultry products accounting for 96 percent of the value, on average, of their production, are the least diversified.
- *Vertical integration*—generally decreases risk associated with the quantity and quality of inputs (or outputs) because the vertically integrated firm retains ownership control of a commodity across two or more levels of activity. Vertical integration also diversifies profit sources across two or more production processes. In farming, vertical integration is most common for turkeys, eggs, and certain specialty crops.
- *Production contracts*—guarantee market access, improve efficiency, ensure access to capital, and lower startup costs and income risk. Production contracts usually detail inputs to be supplied by the contractor, the quality and quantity of the commodity to be delivered, and compensation to be paid to the grower. The contractor typically provides and retains ownership of the commodity (usually livestock) and has considerable control over the production process. On the downside, production contracting can limit the entrepreneurial capacity of growers, and contracts can be terminated on short notice.
- *Marketing contracts*—set a price (or pricing mechanism), quality requirements, and delivery date for a commodity before harvest or before the commodity is ready to be marketed. The grower generally retains ownership of the commodity until delivery and makes management decisions. Farmers generally are advised to forward price less than 100 percent of their expected crop until yields are well assured to avoid a shortfall that would have to be made up by purchases in the open market.
- *Futures contracts*—shift risk from a party that desires less risk (the hedger) to one who is willing to accept risk in exchange for an expected profit (the speculator). Farmers who hedge must pay commissions and forego interest or higher earning potential on money placed in margin deposits. Generally, the effectiveness of hedging in reducing risk diminishes as yield variability increases and the relationship (correlation) between prices and yields becomes more negative. Hedging can reduce, but never completely eliminate, income risk.
- *Futures options contracts*—give the holder the right, but not the obligation, to take a futures position at a specified price before a specified date. The value of an option reflects the expected return from exercising this right before it expires and disposing of the futures position obtained. Options provide protection against adverse price movements, while allowing the option holder to gain from favorable movements in the cash price. In this sense, options provide protection against unfavorable events similar to that provided by insurance policies. To gain this protection, a hedger in an options contract must pay a premium, as one would pay for insurance.
- *Liquidity*—involves the farmer's ability to generate cash quickly and efficiently in order to meet financial obligations. Some of the methods that farmers use to manage liquidity, and hence financial risk, include: managing the pace of investments (which may involve postponing machinery purchases), selling assets (particularly in crisis situations), and holding liquid credit reserves (such as access to additional capital from lenders through an open line of credit).
- *Crop yield insurance*—provides payments to crop producers when realized yield falls below the producer's insured yield level. Coverage may be through private hail insurance or federally subsidized multi-peril crop insurance. Risk protection is greatest when crop insurance (yield risk protection) is combined with forward pricing or hedging (price risk protection).
- *Crop revenue insurance*—pays indemnities to farmers based on revenue shortfalls instead of yield or price shortfalls. As of 1998, three revenue insurance programs (Crop Revenue Coverage, Income Protection, and Revenue Assurance) were offered to producers in selected locations. All three are subsidized and reinsured by USDA's Risk Management Agency.
- *Household off-farm employment*—may provide a stream of income to the farm operator household that is more reliable and steady than returns from farming. In essence, household members working off the farm is a form of diversification. In 1996, according to USDA's ARMS data, 82 percent of all farm households reported off-farm income exceeding farm income. In every sales class (including very large farms), at least 28 percent of the associated farm households had off-farm income greater than farm income.

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What Steps Would Farmers Take to Manage Financial Difficulties?

	Small farms*		Large farms**		Total U.S.
	Less than \$50,000	\$50,000-\$249,999	\$250,000-\$499,999	\$500,000 or more	
	Percent of farms				
Management/financial strategy:					
Restructure debt	24	48	46	49	30
Sell assets to reduce debt	31	28	31	29	30
Use more custom services	7	18	17	20	10
Scale back farm business	26	23	20	24	25
Diversify into other farm enterprises	12	23	21	21	15
Spend more time on management	19	38	47	45	24
Use advisory services	19	22	28	26	20
Adjust operating costs	34	54	59	57	40
Improve marketing skills	30	47	53	53	35

*Annual gross sales under \$250,000. **Annual gross sales \$250,000 or more.

Source: 1996 Agricultural Resource Management Study, USDA

Economic Research Service, USDA

virtually all other types of risk management strategies. In contrast, operators with sales under \$50,000 were less likely to use forward contracting or hedging, and fewer reported using enterprise diversification to reduce risk.

The ARMS data also indicated that producers in the Corn Belt and Northern Plains were somewhat more likely to use risk management strategies than those in the Southern Plains, Northeast, and Appalachia. About 40 percent of producers in the Corn Belt and Northern Plains regions used forward contracting in 1996 and about 25 percent used hedging in futures or options.

Farm legislation also affects adoption of risk management strategies. About one-third of producers nationwide reported receiving direct government commodity payments in 1996. Of these, between 5 and 8 percent (1-3 percent of all U.S. farmers) indicated they had added or increased use of at least one risk management strategy or tool (forward contracting, hedging, insurance, or other strategy) in 1996 in response to provisions of the 1996 Farm Act.

A period of financial stress may induce an operator to shift risk management strategies. The 1996 ARMS questioned farmers about production, marketing, and financial activities they might undertake if faced with financial difficulty. Producers with sales of \$50,000 or more indicated they would adjust costs, improve marketing skills, restructure debt, and spend more time on management decisions.

Producers with sales under \$50,000 (who generally receive a substantial share of household income from off-farm sources) also responded that they would adjust costs when faced with financial difficulties. But small-farm operators would be more likely than larger operators to sell farm assets or scale back their operations. Further, small-scale producers were much less likely to spend more time on management or on improving their marketing skills.

When individual efforts to deal with financial stress fail and large numbers of farms face significant financial loss, the Federal government has often stepped in with assistance to agriculture in the form of direct payments, loans, and other types of aid. Most recently, the 1999 Agricul-

tural Appropriations Act included \$2.375 billion for emergency financial assistance to farmers who suffered losses due to natural disasters. Under this legislation, farmers are eligible for payments either for losses to their 1998 crop, or for losses in any 3 or more crop years between 1994-98. Farmers with crop insurance receive slightly higher payments than those without, and those receiving emergency benefits must agree to buy crop insurance (if available) in 1999 and 2000. In addition, the legislation provides an incentive for purchasing higher levels of crop insurance coverage in 1999 by earmarking an estimated \$400 million to subsidize farmers' insurance premiums.

Such assistance is undoubtedly critical for producers who are facing financial difficulty. However, it raises questions as to how the potential for direct payments in times of disaster affects producers' decisionmaking with regard to tools and strategies that can help them manage risk and perhaps avoid financial stress. Linking receipt of government assistance to adoption of a risk management strategy, namely the purchase of crop insurance, encourages producers to gain experience with a program that can provide protection in crisis years in the future. Understanding the risks faced in farming and the use of different tools by producers can lead to new strategies and educational approaches to cut risk and can perhaps help reduce the incidence of farm financial stress. **AO**

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